Table 1 Results for the subject's visual acuity, contrast sensitivity, colour vision, fundus examination, Humphrey visual field analysis and optical coherence tomography

	Visit A	Visit B	Visit C
Visual acuity (OU)	20/200 OU	20/80 OD 20/60 OS	20/60 OU
Contrast sensitivity (OD)			
High spatial frequency	No ability	No ability	No ability
Low spatial frequency	Below 10% of that observed in a normal population	Up to 70% of that observed in a normal population	Up to 90% of that observed in a normal population
Colour vision (OD)	50% error (4/8 plates correctly scored)	50% error (4/8 plates correctly scored)	50% error (4/8 plates correctly scored)
Fundus examination (OU)	Persistent temporal pallor and thin NFL		
Humphrey VF analysis	Within normal limits (MD = −0.49 dB, PSD = 1.81 dB)	Superior VF defect and OD (MD = −9 (6.24) dB, $p<0.01$, PSD = 6.61 dB, $p<0.005$)	Improved superior VF defect and OD, when compared with visit B (MD = −5.4 (3.29) dB, $p<0.01$, PSD = 3.77 dB, $p<0.02$)

MD, mean deviation; NFL, nerve fibre layer; PSD, pattern standard deviation; VF, visual field.
High spatial frequency of contrast sensitivity comprised of 12 cycles/degree and 18 cycles/degree on the Vision Contrast Test System (VCTS) chart.
Low spatial frequency of contrast sensitivity comprised of 1.5, 3, and 6 cycles/degree on the VCTS chart. The Humphrey VF analysis was performed on the right eye.

because of their larger volume in comparison to P cells.[6–9] It is reasonable to suggest that the reversible axonal changes we observed within the peripheral RNFL were due to a significant recovery of the retinal ganglion cells, most notably M cells, after the cessation of EMB.

Christopher I Zoumalan, Alfredo A Sadun
Department of Ophthalmology, Doheny Eye Institute, Keck School of Medicine, University of Southern California, Los Angeles, California, USA

Correspondence to: Dr C I Zoumalan, Department of Ophthalmology, Stanford University Medical Center, 900 Blake Wilbur Drive, Room W3002, Stanford, CA 94305, USA; zoumalan@stanford.edu

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Frequency of retinal macroaneurysms in adult Chinese: the Beijing Eye Study

A retinal arterial macroaneurysm is an acquired retinal vascular abnormality, typically a solitary, round or fusiform aneurysm arising in one of the four major branch retinal arteries in the paramacular area. According to hospital-based investigations, most patients in whom this pathological condition develops are in their sixth or seventh decade of life and have a history of systemic hypertension, ophthalmoscopic evidence of retinal arteriolar sclerosis or both. Visual loss is caused by exudation or bleeding from the aneurysm. Massive retinal bleeding from a ruptured aneurysm can be confined to the preretinal, intraretinal or subretinal space, or dispersed into the vitreous.[1–4] Since most reports on retinal macroaneurysm arise from hospital-based studies and because no information is available about the prevalence of retinal macroaneurysms, particularly in the Chinese population, this population-based study was conducted.

Case report

The Beijing Eye Study is a population-based cohort study in northern China, carried out in four communities from the Haidian urban district in the Northern part of central Beijing and in three communities from a rural district in the village area of Yufa (Daxing District) in the south of Beijing.[5] The medical ethics committee of the Beijing Tongren Hospital, Beijing, China approved the study protocol, and all participants gave informed consent, according to the Declaration of Helsinki. At the time of the survey in the year 2001, there were 5324 individuals aged ⩾40 years residing in these 7 communities. In all, 4439 individuals (2505 women) participated in the eye examination, corresponding to an overall response rate of 83.4%. This study included 8609 eyes of 4335 (97.7%) subjects for whom readable fundus photographs were available. Mean age was 56.0 (10.4) years (range 40–101 years), mean refractive error was −0.39 (2.24) D (range −20.13 to +7.50 D). The examinations performed during the study included colour photographs of the optic disc and macula.

Two retinal macroaneurysms were detected on the fundus photographs of one eye (prevalence rate per eye: 0.01% (0.01%) (mean (SE)); 95% CI 0.00% to 0.03%) of a female subject aged 67 years (prevalence rate per subject 0.02% (0.02%); 95% CI 0.00% to 0.07%). Visual acuity was hand movements due to marked macular oedema with pronounced deposition of hard exudates in the foveal region. One of the macroaneurysms was located superior to the fovea and inferior to the superior temporal vessel arcade leading to the foveal oedema; the other macroaneurysm was located nasally to the optic disc at a distance of about 1.5 mm. The intraocular pressure was 15 mm Hg. The contralateral eye showed a normal ophthalmoscopic appearance of the fundus.

Comment

The data suggest that retinal macroaneurysms may occur in about 1 of 9000 eyes or in approximately 1 of 4500 adult Chinese.

Liang Xu, Yaxing Wang
Beijing Institute of Ophthalmology, Beijing Tongren Hospital, Capital University of Medical Science, Beijing, China

Jost B Jonas
Department of Ophthalmology, Faculty of Clinical Medicine Mannheim, University of Heidelberg, Mannheim, Germany

Correspondence to: Professor J B Jonas, Beijing Institute of Ophthalmology, 17 Hougou Street, Chong Wen Men, 100005 Beijing, China; jost.jonas@augen.ma.uni-heidelberg.de

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Amniotic membrane-covered bio-onlays for treatment of ocular surface disease

Amniotic membrane (AM) transplantation has been used successfully for the treatment of ocular surface diseases for several years.[1–3] Indications for use of AM at the cornea include persistent epithelial defects, corneal ulcers and chemical burns.[1–3] Surgical strategies for AM placement onto the cornea are suturing AM onto the corneal surface (''patch''), into a corneal defect (''graft'') or a combination of both strategies (''sandwich'').[1–5]

All published reports for use of AM in patients are based on the use of sutures. Although most patients can be treated with the suture-based approach, there are several situations in which sutures should be avoided: patients under intensive care, long-lasting corneal epithelial defects causing a cornea too thin to support sutures or sutures may be technically difficult to place in the case of a previous graft, and, in addition, sutures can induce scarring and neovascularisation.[6] Since the beneficial effects of AM are at least partially mediated by agents released from AM and by AM acting as a natural bandage contact lens,[1–5] we reasoned that an AM-covered ''bio-onlay'' may have the same beneficial effects as a sutured graft while avoiding the detrimental effects of sutures. Here we describe a novel sutureless technique using AM to treat persistent corneal epithelial defects.

First, a novel technique for the coating of Illig shells (Müller & Söhne, Wiesbaden, Germany) with AM (bio-onlays) was developed. Initially, the correct size of the Illig shell was determined for each patient (fig 1A). Next, under sterile conditions in the operating room, a sheet of freeze-stored AM (2.5×3.5 cm) was placed around the Illig shell and secured using 8-0 vicryl sutures (fig 1B). The epithelial side of the AM was placed outwards. Suturing takes more time compared with placing just a single AM patch. Finally, the AM-covered bio-onlay was placed onto the eye of the patient using topical anaesthesia (fig 1C). AM-covered bio-onlays were left in place for 2 weeks under topical treatment with lubricants, antibiotics and serum eye drops. After 2 weeks, the device was removed at the slit-lamp examination using topical anaesthesia.

This technique was used in two patients with persistent epithelial defects (after prior informed consent): a 36-year-old patient with neurotrophic keratopathy after keratoplasty (fig 1D) and a 28-year-old woman with chronic graft-versus-host disease. Both defects had not healed with intensive topical treatment, including serum eye drops for several weeks (8 and 6 weeks, respectively). In both patients, AM-covered bio-onlays were tolerated well.

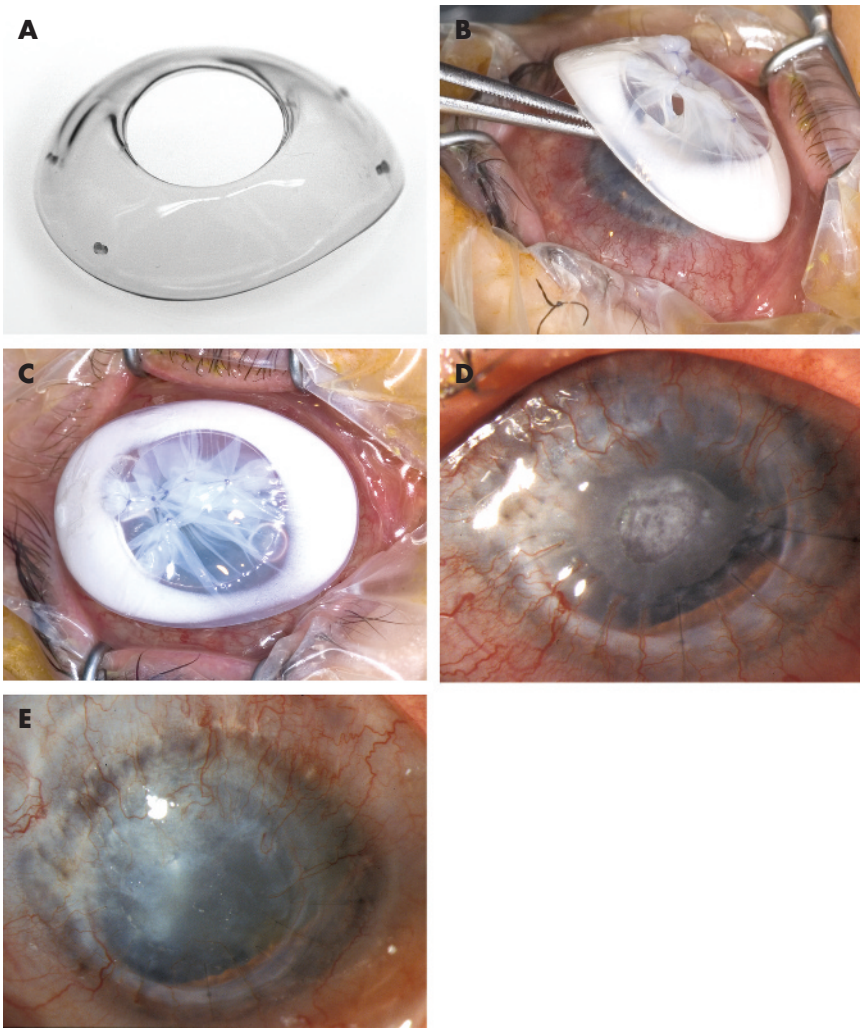

Figure 1 Amniotic membrane (AM)-covered bio-onlays were used for sutureless treatment of persistent corneal epithelial defects. An individualised Illig shell (A) was coated by a single sheet of AM (epithelial side outwards) and sutured at the outer side using 8-0 vicryl (B). This device was then placed onto the cornea under topical anaesthesia (C) and left in place for 2 weeks. A persistent epithelial defect secondary to neurotrophic keratopathy after penetrating keratoplasty (D) healed completely within 2 weeks of bio-onlay treatment (E).

When removed after 2 weeks, AM covering the surface was intact and the persistent epithelial defects were completely healed (fig 1E). There was no evidence for induction of corneal angiogenesis due to the device.

To study the integrity of AM, the membrane was fixed and subjected to histological examination: as can be seen in fig 2A, the AM covering the Illig shell was well preserved (fig 2B). Epithelium and basement membrane of AM appeared intact (fig 2C,D). Using immunohistochemical analysis with CD45 as panleucocyte and CD68 as macrophage marker (Dako, Hamburg, Germany),[6] we ruled out a significant accumulation of inflammatory cells on the surface of or within the bio-onlay (fig 2E,F). This lack of inflammatory cell ''trapping'' within the AM-covered bio-onlay is in contrast with previous observations made with AM layered directly onto inflamed corneas,[7] and may be due to (1) only partial direct contact of the bio-onlay with the ocular surface and (2) lack of an inflammatory, chemotactic stimulus within the bio-onlay attracting inflammatory cells in contrast with the scenario of an AM placed onto an inflamed corneal stroma.[7]

In summary, we demonstrate a novel sutureless method of application of AM onto the ocular surface using AM-covered bio-onlays. A small pilot study provides proof of concept and demonstrates that the technique was well tolerated. AM-covered bio-onlays seem to be beneficial because they act as a natural bandage contact lens and, in addition, exert trophic and anti-inflammatory effects. More patients will have to be studied under controlled conditions to further evaluate this promising new technique. Our pilot study paves the way towards non-surgical use of AM components for surface reconstruction and for anti-inflammatory/anti-angiogenic treatment.[6 8]

C Cursiefen, C Rummelt
Department of Ophthalmology, Friedrich-Alexander University, Erlangen-Nuremberg, Erlangen, Germany

M W Beckmann
Department of Gynaecology, Friedrich-Alexander University, Erlangen-Nuremberg, Erlangen, Germany